



U.S. Department of Energy
Office of River Protection

P.O. Box 450
Richland, Washington 99352

02-OSR-0595

Mr. R. F. Naventi, Project Manager
Bechtel National, Inc.
2435 Stevens Center
Richland, Washington 99352

Dear Mr. Naventi:

CONTRACT NO. DE-AC-01RV14136 – AS LOW AS REASONABLY ACHIEVABLE
(ALARA) PROGRAM ASSESSMENT INSPECTION REPORT, A-03-OSR-RPPWTP-003, FOR
NOVEMBER 16, 2002, AND NOVEMBER 18 THROUGH 21, 2002

This letter forwards the results of the subject inspection. The inspection team concluded Bechtel National, Inc. (BNI) was implementing the ALARA process. One Finding and an Assessment Follow-up Item (AFI) were noted. The Finding is documented in the Notice of Finding (Enclosure 1). Details of the inspection, including the Finding, are documented in the Inspection Report (Enclosure 2).

The Finding, embedment of High-Level Waste C5 exhaust ducting without some required decontamination and decommissioning provisions, indicates authorization basis commitments were not being fully implemented by design engineering. In your response to this Finding, please describe your process to ensure "conditions of acceptance" presented in ORP/OSR-2002-18, *Safety Evaluation Report for Waste Treatment and Immobilization Plant (WTP) Construction Authorization*, Revision 2, are being effectively communicated to those designing the facility. Also, please confirm your staff is designing the WTP for decontamination and decommissioning consistent with possible demolition of the WTP as a potential endpoint in the closure process.

The AFI involves oversight of subcontractors performing radiography at the construction site on Saturday, November 16, 2002. The inspectors observed inadequate control of the radiography source, marginal radiation surveys to verify the unrestricted area boundary, violation of your danger barriers, and marginal oversight of the subcontractor by your radiation safety staff. These observations present an opportunity for BNI to improve its oversight of radiography subcontractors.

Mr. R. F. Naventi
02-OSR-0595

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If you have any questions, please contact me, or your staff may contact Pat Carier, WTP Safety Regulation Division, (509) 376-3574.

Sincerely,

Roy J. Schepens
Manager

OSR:JLP

Enclosures (2)

cc w/encls:
W. R. Spezialetti, BNI

NOTICE OF FINDING

Section C.6, Standard 7, “Environment, Safety, Quality, and Health,” of Contract DE-AC27-01RV14136, dated December 11, 2000, between Bechtel National, Inc. (BNI [the Contractor]) and the U.S. Department of Energy (DOE), defined the Contractor’s responsibilities under the Contract as they related to conventional non-radiological worker safety and health; radiological, nuclear, and process safety; environmental protection; and quality assurance.

Standard 7, Section (d) of the Contract required the Contractor to develop and implement an integrated, standards-based, safety management program to ensure that radiological, nuclear, and process safety requirements are defined, implemented, and maintained. The Contractor is required to conduct work in accordance with the Contractor developed and DOE approved Safety Requirements Document (SRD).

The Contractor’s SRD was defined in 24590-WTP-SRD-ESH-01-001-02, Revision 0, dated October 14, 2001.

Standard 7, Section (e)(2)(ii) of the Contract required the Contractor to comply with the specific nuclear regulations defined in the effective rules of the Title 10 Code of Federal Regulations (CFR) 800 series of nuclear requirements.

10 CFR 835, “Occupational Radiation Protection,” Subpart K, “Design and Control” required the Contractor to design the facility to include features that facilitate decontamination and decommissioning.

Section C.7, “Facility Specifications” of Contract DE-AC27-01RV14136, dated December 11, 2000, between BNI (the Contractor) and DOE, stated in (a) Functional Design Requirements, the River Protection Project (RPP) Waste Treatment and Immobilization Plant (WTP) shall be designed to:

- (7) “Be safely and efficiently deactivated, decommissioned, and closed at the completion of the WTP mission.”
- (12) “Include process and facility design features to safely and efficiently facilitate deactivation, decontamination, decommissioning, and RCRA closure of the facilities.”

During the performance of an inspection of the RPP WTP construction, conducted within the period November 16, 2002, and November 18 through November 21, 2002, at the Contractor’s offices and WTP construction site, the following item was identified:

- SRD Safety Criterion: 8.0-2 required facilities be designed to simplify decontamination and decommissioning, reduce exposure to site personnel during these activities, minimize the generation of radioactive waste, and increase the potential for reuse.

Contrary to the above, during 2002, the Contractor designed and embedded portions of the High-Level Waste (HLW) C5 exhaust duct/piping without implementing provisions to simplify and facilitate decontamination, decommissioning, and closure of the facility described in a Contractor letter.¹ These provisions included sloping the pipe and remote access for chemical or mechanical cleaning. The design engineer and Radiological and Fire Protection Manager stated the embedded HLW C5 ducting was designed to remain in place without decontamination or provisions for removal. This is considered an inspection Finding (see Inspection Report A-03-OSR-RPPWTP-003, Section 1.4.2, A-03-OSR-RPPWTP-003-F01).

The Contractor is requested to provide, within 30 days from the date this letter, a reply to the above Finding. The reply should include: 1) admission or denial of the Finding; 2) the reason for the Finding, if admitted, and if denied, the reason why; 3) the corrective steps that have been taken and the results achieved; 4) the corrective steps that will be taken to avoid such further Findings; and 5) the date when full compliance with the applicable commitments in your authorization bases will be achieved. Where good cause is shown, consideration will be given to extending the requested response time.

¹ BNI letter from A. R. Veirup to M. K. Barrett, DOE Office of River Protection, "Closeout Comments on Low Activity and High Level Waste Partial Construction Authorization Request," CCN 035123, dated June 20, 2002.

U.S. DEPARTMENT OF ENERGY
Office of River Protection
WTP Safety Regulation Division

INSPECTION: As Low As Reasonably Achievable Program Inspection

REPORT NO. A-03-OSR-RPPWTP-003

FACILITY: Bechtel National, Inc.

LOCATION: 2435 Stevens Center
Richland, Washington 99352

DATES: November 16, and November 18 through 21, 2002

INSPECTORS: J. Polehn (Team Leader), Senior Regulatory Technical Advisor
L. McKay, Team Member
G. Yuhas, Team Member

APPROVED BY: P. Carrier, Verification and Confirmation Official
WTP Safety Regulation Division

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EXECUTIVE SUMMARY

As Low As Reasonably Achievable Program Inspection

INTRODUCTION

The scope of this inspection of the Bechtel National, Inc. (the Contractor) focused on the As Low As Reasonably Achievable (ALARA) Program during design and construction of the Waste Treatment and Immobilization Plant (WTP) and covered the following specific areas:

- ALARA Program Documentation (Section 1.2)
- ALARA Program Implementing Procedures (Section 1.3)
- ALARA Design (Section 1.4)
- ALARA During Construction (Section 1.5)
- ALARA Records (Section 1.6).

SIGNIFICANT OBSERVATIONS AND CONCLUSIONS

- The Contractor's ALARA program document had not changed since the last inspection and continued to satisfy the commitments in the Radiation Protection Program for Design and Construction. Proper implementation of this program should ensure compliance with the requirements expressed in 10 CFR 835, *Occupational Radiation Protection*, Subpart K, *Design and Control*. Though the Contractor's Environmental Radiation Protection Plan was in draft form, the Contractor's occupational ALARA program was used to ensure minimization of effluent releases of radioactive material and radiation were incorporated in the design. (Section 1.2)
- Recently, changes were made to the ALARA program implementing procedure. These changes increased the effectiveness of the ALARA program and were consistent with the Quality Assurance Manual. The *Occupational ALARA Program* implementing procedures were used to satisfy the environmental radiation protection Contract requirements. (Section 1.3)
- The Contractor's ALARA program was adequately implemented in the WTP design. One example was identified of failure to fully implement decontamination and decommissioning Authorization Basis commitments relating to embedment of the High-Level Waste C-5 exhaust ducting/piping. This is a Finding (A-03-OSR-RPPWTP-003-F01). (Section 1.4)
- Observation of radiography at the WTP construction site indicated opportunities to reduce both the dose and the risk of unplanned exposure through better oversight of radiography subcontractors. This is an Assessment Follow-up Item (A-03-OSR-RPPWTP-003-A02). (Section 1.5)

- Since the last ALARA inspection in November 2001, the Contractor identified numerous cases where design documentation did not adequately document the actions taken to ensure the dose would be maintained ALARA. Based on this, the Contractor revised its ALARA implementing procedures to correct the lack of documentation. The changes became effective in September 2002. Review of records in the period from September 2002 through November 2002 found documentation of actions taken to maintain dose ALARA had improved. (Section 1.6)

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AS LOW AS REASONABLY ACHIEVABLE PROGRAM INSPECTION REPORT

1.0 REPORT DETAILS

1.1 Introduction

In accordance with the U.S. Department of Energy (DOE), Office of River Protection (ORP), River Protection Project Waste Treatment and Immobilization Plant (WTP) Contract¹ and, specifically, Title 10 Code of Federal Regulations (CFR) 835, *Occupational Radiation Protection*, Subpart K, *Design and Control*, Bechtel National, Inc. (BNI [the Contractor]) is required to take measures to maintain radiation dose in controlled areas as low as is reasonably achievable (ALARA) through facility and equipment design and administrative control. 10 CFR 835, Subpart B, that required Radiation Protection Programs (RPPs), required the Contractor's RPP include formal plans and measures for applying the ALARA process. These requirements were reflected in the Contractor's Authorization Basis (AB) (e.g., 24590-WTP-RPP-ESH-01-001, *Radiation Protection Program for Design and Construction*, Revision 0, and *Safety Requirements Document*, 24590-WTP-SRD-ESH-01-001-02, Volume 2, Revision 1j).

The scope of this inspection focused on the ALARA Program during design of the WTP and covered the following specific areas:

- ALARA Program Documentation (Section 1.2)
- ALARA Program Implementing Procedures (Section 1.3)
- ALARA Design (Section 1.4)
- Operational ALARA for Limited Construction/Construction (Section 1.5)
- ALARA Records (Section 1.6).

The inspectors reviewed the Contractor's program and procedures to determine if they complied with the commitments in the RPP and other AB documents. In addition, the inspectors assessed the implementation of the Contractor's ALARA program and procedures as they related to the design phase of the WTP Contract to verify the Contractor was following its procedures and properly conducting important-to-safety activities.

The last ALARA inspection of the WTP project took place on November 26, 2001 (IR-01-011). That inspection resulted in no Findings; however, weaknesses were identified in the Contractor's process to establish and maintain records of actions considered or taken to implement ALARA design criteria.

¹ Contract No. DE-AC27-01RV14136 between the U.S. Department of Energy and Bechtel National Inc., dated December 11, 2000.

1.2 ALARA Program Documentation (Inspection Technical Procedure, ITP I-111)

1.2.1 Inspection Scope

The inspectors interviewed Contractor personnel and reviewed the formal plans and measures for applying ALARA during the design process to ensure the regulatory requirements and the AB commitments were met and changes made since the last inspection did not reduce the effectiveness of the RPP.

1.2.2 Observations and Assessments

The inspectors reviewed a controlled copy of 24590-WTP-PL-NS-01-002, Revision 0, *RPP-WTP Occupational ALARA Program*, and discussed the matter with the Radiological Operations Lead Engineer. The *RPP-WTP Occupational ALARA Program* had not been changed since the last ORP WTP Safety Regulation Division (OSR) inspection in November 2001.

The BNI Environmental Manager and the Regulatory Integration Lead stated no specific procedures had been established to implement the draft WTP Environmental Radiological Protection Program (ERPP) (24590-WTP-PL-ENV-01-006, Revision B, *WTP Environmental Radiological Protection Program - Draft*, [ERPP] March 12, 2002). However, the Radiological and Fire Protection Manager, and other senior managers, stated the intent of the ERPP was being implemented through the use of the WTP occupational ALARA procedures. This was acceptable to the inspectors.

1.2.3 Conclusions

No changes have been made to the WTP ALARA Program since the last OSR inspection in November 2001. The ERPP program remains in draft. Specific ERPP implementing procedures had not been established.

1.3 ALARA Program Implementing Procedures (ITP I-111)

1.3.1 Inspection Scope

The inspectors reviewed the ALARA program implementing procedures, documentation, and training records to determine if changes made since the last inspection reduced the effectiveness of the ALARA program. Contractor audits, assessments, and Corrective Action Requests (CAR) related to ALARA procedures were evaluated. The scope included observations of procedure implementation and discussion with Contractor representatives.

1.3.2 Observations and Assessments

The Contractor's ALARA program was implemented by the following procedures:

- 24590-WTP-GPG-SRAD-001, Revision 0, *Design Guide for ALARA*, September 28, 2001.
- 24590-WTP-GPG-SRAD-002, Revision 0, *Shield Doors & Gamma Gates in Design*, September 28, 2001.
- 24590-WTP-GPP-SRAD-001, Revision 0, *Radiation Dose Rate Calculations*, September 28, 2001.
- 24590-WTP-GPP-SRAD-002, Revision 1, *Application of ALARA in the Design Process*, September 20, 2002.
- 24590-WTP-GPP-SRAD-005, Revision 0, *Shielding Assessment Report*, September 28, 2001.
- 24590-WTP-GPP-SRAD-006, Revision 0, *Dose Assessment Report*, September 28, 2001.
- 24590-WTP-GPP-SRAD-007, Revision 0, *Classification of Areas*, September 28, 2001.
- 24590-WTP-GPP-SREG-001, Revision 3, *Project Safety Committee*, October 17, 2002.

The above procedures were reviewed to determine if there had been any changes to the program since the last ALARA inspection of November 2001, and to determine the adequacy and effectiveness of the ALARA program Procedures. The inspectors found the Contractor had established and implemented its process for ALARA design, radiation protection design of the facility, and identified the occupational and public dose goals for design of the WTP. Changes had been made to the ALARA program since the last inspection and the discussion of these changes follows.

The last inspection identified a weakness in the Contractor's process to establish and maintain records of actions considered or taken to implement ALARA design criterion. Since that inspection, three CARs (24590-WTP-CAR-QA-02-080, 084, and 111) related to ALARA records were issued. Management Assessment (MA), 24590-WTP-MAR-ENG-02-002, documented the assessments performed in May and October 2002. The MA report found, "Of 517 drawings issued between 12 January 2002 and 02 May 2002, 365 were judged to contain radiation protection information. ADRs (ALARA Design Reviews) are believed applicable to 90 of these drawings. The remaining 275 cannot be shown to comply with 24590-WTP-GPP-SRAD-002 requirements to document ALARA." The group conducting the assessment made six recommendations: (1) ADRs should be required for all drawings, system descriptions, and engineering specifications with radiation protection information; (2) Discipline specific ALARA checklists should be used; (3) The title blocks on drawings, system descriptions, and specifications should contain a box with a check to indicate if the content is applicable to ALARA and the ADR number if it is; (4) Procedures should be changed to make clear ADRs may apply to more than one document; (5) Engineering and ALARA procedures should be revised to clarify and cross-reference requirements; and (6) Procedures should be revised to provide options to generate ADRs.

Management representatives of Environment, Safety, and Health (ES&H), Engineering and the ALARA Subcommittee (ASC) endorsed the recommendations and scheduled corrective actions resulting in the September 20, 2002, implementation of 24590-WTP-GPP-SRAD-002, Revision 1, *Application of ALARA in the Design Process* during the months of August and September 2002. The MA report indicated 10 training presentations were made to various Engineering groups and the Project Document Control staff. Three Engineering procedures were revised to reference implementation of *Application of ALARA in the Design Process*. In addition, the Contractor assessment team reviewed drawings issued between January 12 and September 19, 2002, and ADRs were prepared if the drawings impacted ALARA. This process was documented in 24590-WTP-ADR-ESH-02-005.

Since the last inspection, 24590-WTP-GPP-SREG-001, Revision 3, *Project Safety Committee*, had been changed to reflect a new title for the ES&H Manager (i.e., Environment and Nuclear Safety Manager) and to describe the “Safety Improvement Program” reviewed by the Project Safety Committee (PSC) about four times a year. The “Safety Improvement Program,” included the ALARA Subcommittee (ASC). Procedure change records for revisions to 24590-WTP-GPP-SRAD-002, Revision 1, *Application of ALARA in the Design Process*, and 24590-WTP-GPP-SREG-001, Revision 3, *Project Safety Committee*, indicated the changes were made in accordance with 24590-WTP-GPP-CPRO-001, Revision 0, *Production of River Protection Project – Waste Treatment Plant Procedures*. The changes were consistent with the Quality Assurance Manual and did not decrease the effectiveness of the ALARA program. The revised process required design documents to clearly identify whether ALARA was applicable; if ALARA was applicable, the associated ADR should be identified. The changes to the procedure, *Application of ALARA in the Design Process*, if appropriately implemented should improve compliance with the documentation requirements expressed in 10 CFR 835, Subpart H.

The inspectors reviewed the training syllabus and selected training records associated with the change to *Application of ALARA in the Design Process* discussed above. The training was presented to design engineers and included discussion of how their engineering design procedures took them to the ALARA requirements. Review of Training Profiles for the Engineering ALARA Coordinator and other selected design engineers indicated *Application of ALARA in the Design Process* was not on their required reading list. The Engineering ALARA Coordinator stated engineering supervisors decided the required reading list and since the engineering staff had been trained on the changes to *Application of ALARA in the Design Process* there was no need to put it on their list. Several design engineers were interviewed at their workstations. The design engineers’ Training Profiles indicated they received the training. They were familiar with *Application of ALARA in the Design Process* and how to use the discipline-specific ALARA check sheets. Several of the design engineers stated the procedural revision improved the ease and quality of their ALARA work. Based on this information, the inspectors concluded not including *Application of ALARA in the Design Process* on the required reading list was acceptable.

The Training Profile for a Radiological Safety Engineer/Senior Radiological Control Technician was reviewed and found to contain the set of ALARA implementing procedures described above. The Training Profile also included the set of requirements qualifying the individual as a Radiological Control Technician (RCT). The record indicated he was qualified to perform his ALARA and RCT responsibilities. During an interview, the RCT described his extensive

radiological control experience, on and off the Hanford site. This individual was one of two qualified as RCTs to support construction radiological controls such as legacy sampling and monitoring the use of sealed radioactive sources.

The WTP Safety Requirements Document (SRD), 24590-WTP-SRD-ESH-01-001-02, Revision 1j, *River Protection Project – Waste Treatment Plant Safety Requirements Document*, Volume II, Safety Criterion 5.3-1, Environmental Radiation Protection, required the ERPP be prepared and submitted to the regulator and the ERPP address "(2) the measure to be used to implement the ERPP." The document 24590-WTP-PL-ENV-01-006, Revision B, *WTP Environmental Radiological Protection Program – Draft*, was submitted to the ORP and accepted as a draft program. Even though it was a draft document, some parts of the draft ERPP were applicable during the construction phase of the WTP. The inspectors interviewed the Contractor to determine how the applicable portions of the draft ERPP were being implemented. The Contractor stated, and the inspectors confirmed, the *Occupational ALARA Program* implementing procedures were used to implement the ERPP requirements. The inspectors found this acceptable.

1.3.3 Conclusions

Procedures established and maintained to implement the Contractor's ALARA program were adequate. Revisions to 24590-WTP-GPP-SRAD-02, Revision 1, *Application of ALARA in the Design Process*, addressed the weakness identified during the last inspection. The *Occupational ALARA Program* implementing procedures were used to meet the environmental radiological ALARA goals to implement the environmental program.

1.4 ALARA Design (ITP I-111)

1.4.1 Inspection Scope

The inspectors interviewed Contractor personnel and reviewed a small sample of design products to determine if the ALARA process had been implemented. The inspection focused on the High-Level Waste (HLW) C5 exhaust system, HLW melter, HLW melter off-gas, low-activity waste (LAW) melter handling system, Pretreatment (PT) layout, and access controls for high radiation areas. The inspectors also reviewed management involvement in the ALARA design process.

1.4.2 Observations and Assessments

Design Products Reviewed:

- 10 CFR 835.1002 (d) and RPP Requirement 111 stated, "The design or modification of a facility and the selection of materials shall include features that facilitate operations, maintenance, decontamination, and decommissioning." SRD 8.0 required that facilities be designed to simplify decontamination and decommissioning to reduce dose and the

generation of radioactive waste. In the Contractor's letter,² dated June 20, 2002, the Contractor stated in a response to ORP question LAW-PSAR-197:

“The following words will be added to section 16.3.5 D&D Minimization Features: ‘While the proposed decommissioning method has not been specified, the facility is being designed to limit contamination, facilitate decontamination, and minimize the dose and generation of waste in the event reuse or demolition of the facility is the ultimate decommissioning method’.”

In the same letter as above, the Contractor responded to ORP question LAW-PSAR-198 and stated in part:

“The embedded HLW C5 exhaust system design meets the material of construction design criteria that states ‘... construction materials will be resistant to radiation, process solutions, and decontamination agents ...’ for those design aspects associated with Decontamination. The general design approach of stainless steel, round, welded ducting (piping) does not have nooks and crannies and allows for chemical decontamination. The embedded C5 exhaust system has been designed with adequate provision of slope and non-embedded access to minimize the possibility of plugging, settling or other contaminate concentration of duct way occlusion and to allow for maintenance and remote access where applicable and reasonable. During future decommissioning work the embedded HLW C5 exhaust system design will allow access facilitating both chemical and mechanical cleaning of the duct work.”

Review of the drawings (24590 HLW P3 P33T 00001, Revision 3; 00002, Revision 4; and 00003, Revision 3) ALARA Design Review Record 24590-HLW-ADR-PL-02-010, Revision 0, and installation of the HLW C5 embedded piping did not indicate the piping was sloped and non-embedded access provided to facilitate both chemical and mechanical cleaning of the duct work. During discussions with the design engineer, the engineer's supervisor, and representatives of the ALARA program, the inspectors were told the HLW C5 embedded duct/piping was not sloped and no provisions had been made for chemical or mechanical cleaning because they assumed the embedded pipe would be left in place. The individuals were not aware of the commitments made by the Contractor and documented in the Safety Evaluation Report.

SRD 8.0-2 stated, “Facilities shall be designed to simplify decontamination and decommissioning, reduce exposure to site personnel and the public during these activities, and increase the potential for reuse.” The Contractor's response to LAW-PSAR-197 and -198, reaffirmed this commitment and described specific measures to be taken with respect to the HLW C5 embedded duct/piping. Failure to fully implement those commitments in the design is considered a Finding. (A-03-OSR-RPPWTP-003-F01)

² BNI letter from A. R. Veirup to M. K. Barrett, ORP, "Closeout Comments on Low Activity and High Level Waste Partial Construction Authorization Request," CCN 035123, dated June 20, 2002.

Note: IR-02-008-03-IFI previously addressed weld surfaces of the HLW C5 embedded duct. The Contractor's response to this Finding should also address the accumulation of radioactive material on interior weld surfaces if they contain crevices as described in Section 1.7 of this report.

The general design of the HLW confinement and ventilation was discussed with a design engineer, the supervisor and an Engineering ALARA Coordinator. These individuals were familiar with the procedure, *Application of ALARA in the Design Process* and explained how they used the procedure identified checklists (e.g., *General ALARA Design Review* and *Discipline-Specific ALARA Design Review, HVAC/Fire Protection*) in their design process. The inspectors reviewed two completed ALARA design records (24590-HLW-ADR-HV-02-001, Revision 0, *HLW C5V Ventilation System* and 24590-HLW-ADR-HV-02-004, *HLW C3V Ventilation System*).

The completed checklists demonstrated the designer considered confinement and ventilation from an ALARA point-of-view. The engineer stated the system description was not complete and the inspectors were, therefore, unable to review this document. Reliability of exhaust fans was discussed in terms of optimizing dose and cost in context of engineering specifications. The Contractor representative stated engineering specifications were not complete and they typically did not perform formal optimization evaluations. The inspectors discussed the need to perform optimization evaluations when decisions resulting in additional dose are based on cost. The Contractor representatives understood the requirement but indicated they had not yet been confronted with that situation. With respect to HLW confinement and ventilation, the ALARA process was in place, personnel were trained, and procedures were being implemented.

- The inspectors reviewed the following ADRs and design documentation for the LAW Melter Handling System (LMH) and Melter Equipment Support Handling System (LSH): 24590-LAW-ADR-M-02-007, Revision 0, *Multi Discipline ALARA Review for LAW System LMH*; CCN 030535, *System LSH Design Review*; and 24590-LAW-ADR-M-02-006, Revision 1, *LAW Melter Equipment Support Handling System*. The inspectors found the documents addressed appropriate discipline specific criteria for implementing ALARA and provided adequate discussion on the ALARA aspects of the design. Five design drawings for these systems were reviewed and found consistent with the ADRs. During an interview with the lead design engineer for these systems, the inspectors found the individual conversant with the ALARA implementing procedures. When asked for the System Description, the individual stated it was not yet complete or ready for review. The inspectors found only 20 completed System Descriptions and none involved significant radiological impact.
- The inspectors interviewed the Radiological Safety Engineer (Lead, PT) and reviewed PT design documents. *Piping & Instrumentation Drawing*, 24590-POTF-M6-PWD-00050, Revision 0, October 30, 2002, contained the procedure required "ALARA box" and referenced the associated ADR for the *Plant Wash & Disposal System – Secondary Containment*, 24590-PTF-ADR-M-02-004, Revision 0. this should facilitate documentation of the WTP ALARA activities. The inspectors reviewed the Micro Shield computer-generated shielding analyses for wall thickness and identified no deficiencies.

Based on a review of working documents (no document numbers), current design met or exceeded the Micro Shield generated wall thickness so the design was conservative with regard to radiation dose. The inspectors also reviewed ADR 24590-PTF-ADR-M-02-004, Revision 0, *Transfer Piping & Leak Detection System*, dated July 30, 2002. The checklist format facilitated the ALARA design review. The Radiological Safety Engineer was in the process of relocating his office, and stated the Contractor is attempting to co-locate engineers according to the WTP building they support. The intent of the relocation was to facilitate communications among engineers and therefore potentially enhancing the ALARA process during design.

- The inspectors compared the provisions of the HLW vitrification offgas treatment system, BNFL-5193-HAR-01, Revision 3, *Hazard Analysis Report*, Section 2.3.10, to confirm the Integrated Safety Management Plan (ISMP) Section 3.9.1 requirements were addressed. The inspectors confirmed the ISMP Section 3.9.1 criteria for confinement, shielding, access control, and monitoring had been addressed in the offgas treatment system design. Specification 24590-HLW-3PS-MBT0-T0001, Revision 1, *Engineering Specification for Silver Mordenite Column Design and Fabrication*, August 15, 2002, did not contain the “ALARA block” and the associated ADR information required by procedure to indicate ALARA was applicable and tie in the appropriate ADR number. However, the inspectors viewed Revision 2 of the specification, (which had not been officially released and was therefore not citable in this report) and confirmed both the “ALARA block” and the ADR information were contained on the latest revision of the specification. The inspectors confirmed the ADR (24590-HLW-ADR-M-02-045, Revision 0, *Engineering Specification for Silver Mordenite Column Design and Fabrication*) associated with the specification had been written as required by procedure.
- For the HLW Facility Canister Rinse Bogie Power and Control System, the inspectors reviewed a set of meeting minutes and five ALARA Design Review Records to verify the Contractor had implemented its ALARA program and procedures (for example, 24590-HLWS-ADR-M-02-010, Revision 0, March 18, 2002, *Shielding Doors for Bogie Maintenance Areas*). The inspectors interviewed Contractor design staff and found them knowledgeable of the ALARA program and procedures. The inspectors reviewed the training profiles of these individuals and found they had been trained on the ALARA program and procedures.
- The inspectors interviewed Contractor staff and reviewed documents for the HLW Glass Melters. The document, 24590-HLW-ADR-M-02-011, Revision 0, April 17, 2002, ALARA Design Review Record, *MultiDiscipline Design Review for HLW System HMM*, addressed the ISMP Section 3.9.1 requirement elements of confinement, shielding, and access control. Discussions with the Contractor revealed the monitoring requirement of ISMP, Section 3.9.1 had not yet been addressed because the stage of the design of the project had not advanced enough. The Contractor staff indicated the melter design had not yet been completed; it was at about 90 percent complete. The inspectors reviewed the training profiles of the interviewed individuals and found they had been trained on the ALARA program and implementing procedures and were aware of the ISMP elements.

- For control of access to high and very high radiation areas, the inspectors reviewed two ASC and two PSC meeting minutes from November 2001 through March 2002 and interviewed Contractor staff. Though no final design documents were available during this inspection for access control due to the early stage of the design in this area, the above documents and discussions with Contractor staff indicated the project's entry control approach for high and very high radiation areas was consistent with the 10 CFR 835.502(b) and RPP Requirement 61 requirements.

Based on the design products information discussed in this section of the report, the inspectors found the ITS embedded HLW C5 exhaust system did not meet the authorization basis requirements to simplify decontamination and decommissioning. The inspectors found the other six design product areas reviewed were consistent with the ALARA program requirements and the authorization basis requirements. Improvement in the documentation of the ALARA activities was noted in two of the six design products as a result of implementation of the revised ALARA program discussed in Section 1.3.2 of this report.

Management Involvement in ALARA Design:

- The inspectors reviewed 10 WTP Radiation Protection Program assessment reports issued since the last OSR inspection in November 2001. The assessment reports contained sufficient information to determine compliance with the audit requirements in 10 CFR 835, Subpart B. The same individual performed all these assessments (Radiological Safety Engineer II), with none being performed by the Radiological Operations Lead Engineer. As a result, the benefit from a second professional Health Physicist's viewpoint was not realized. While this is not a requirement, using multiple assessors may strengthen the assessment program.

To evaluate the corrective action process, the inspectors requested objective evidence that the three recommendations in the April 2002 assessment report had been implemented. The Radiological Safety Engineer II produced the evidence (procedure revisions).

- The inspectors reviewed meeting minutes since the last ALARA inspection for the ASC and the PSC. The six ASC meeting minutes records (November 14, 2001 through September 5, 2002) showed continuing ALARA oversight action and adequately identified the topics discussed. Three PSC meeting minutes records were provided for review during this inspection as follows: the 40th *Project Safety Committee Meeting*, CCN 029185, February 13, 2002; the 43rd *Project Safety Committee Meeting*, CCN 033120, March 20, 2002; and, the 52nd *Project Safety Committee Meeting*, CCN 035797, June 5, 2001. Other than minor typographical errors (i.e., the date of the 52nd meeting) that could make such records difficult to locate in the future, the records indicated management oversight of ALARA issues was consistent with the ALARA Program requirements and the ASC charter.

The inspectors did not observe an ASC meeting because the committee did not meet during this inspection. However, the inspectors observed the 71st PSC meeting on November 20, 2002, and evaluated meeting conduct against the implementing procedure.

This regularly scheduled PSC meeting was held in accordance with the implementing procedure, 24590-WTP-GPP-SREG-001, Revision 3, *Project Safety Committee*, dated October 17, 2002. A quorum was present. The meeting was held as shown on a written agenda, with a “PSC Action Status” table attached. The PSC chairman moved the meeting crisply along, and meaningful dialog was held on the four technical agenda items. Three of the four items were approved, with the fourth tabled for further evaluation.

The scope of the PSC is to review safety in general, but at the November 20, 2002, meeting a radiological control issue was included. A proposal 24590-WTP-ABCN-ESH-02-031 was presented, to change from International Commission on Radiological Protection Publication 26/30 to Publications 68, 71, and 72 dose conversion factors for calculating accidental doses. The Chairman and Members held considerable dialog on this proposal (which was approved); the nature of the questions asked and answers revealed an appreciation for the radiological control impact of this proposal.

The PSC Secretary published the meeting minutes, but the last published minutes were for the June 19, 2002, meeting. The PSC Secretary stated the PSC meetings are scheduled weekly, but the distribution of PSC meeting minutes was not timely and the PSC procedure provided no guidance.

Management oversight in the form of the ASC and PSC was consistent with the WTP Occupational ALARA Program requirements and the ASC Charter.

Based on the information discussed above, the inspectors found reasonable management involvement in ALARA design through the management assessments and the ASC and PSC activities.

1.4.3 Conclusions

The inspectors identified one Finding, noted above as A-03-OSR-RPPWTP-003-F01, for failure to fully implement the authorization basis commitments. The Finding involving the HLW C5 exhaust embedment, indicated the design engineering and ALARA representatives were not aware of the commitment to design the exhaust piping to facilitate decontamination, minimize the dose and generation of waste in the event reuse or demolition of the facility is the ultimate decommissioning method. For the other six WTP design products, the inspectors found the ALARA program was implemented in the design and involvement of management in the design was observed in the form of management assessments and the ASC and PSC activities. Improvement in documentation of the ALARA activities was observed on two of the design products reviewed as a result of implementation of recent changes to the ALARA program.

1.5 Operational ALARA for Limited Construction/Construction (ITP I-111)

1.5.1 Inspection Scope

The inspectors interviewed Contractor staff, reviewed documents, and observed construction activities to determine if the Contractor had implemented and maintained an effective operational ALARA program. Specifically, this portion of the inspection focused on observation of the Contractor's control of radiography and installation of HLW C5 ventilation ducting during construction of the WTP.

1.5.2 Observations and Assessments

Radiography represents the greatest opportunity for workers to receive unplanned dose during construction. Procedure 24590-WTP-GPP-SRAD-028, Revision 0, *Radiation Generating Device Control*, identified the major requirements for control of radiation generating devices, including radiographic equipment used on site. Based on observations of radiography conducted on November 16, 2002, review of records, and discussions with Contractor representatives the inspectors found:

1. The radiography was scheduled on a weekend to reduce the probability of unnecessary dose to the construction work force.
2. ALARA was not discussed at the pre-job briefing.
3. Two Contractor representatives did not demonstrate ALARA. They were standing next to the radiographer's boundary when it was not necessary. They moved to a lower dose rate location when it was brought to their attention.
4. Although the Contractor representatives stated they had completed Hanford General Employee Training, they had not received any supplemental instructions related to radiography and ALARA.
5. The Radiographer crossed under the Contractor's red "Danger" barricade ropes.
6. The Radiographer's Assistant failed to lock the radiography source in its storage container and did not have it under constant surveillance when located in the unlocked storage container.
7. The Radiographer's Assistant did not conduct a fully adequate verification survey of the radiation boundary around the PT radiography operation due to industrial safety concerns and poor technique. Because he was walking quickly across rebar, he frequently took his eyes off the instrument face to avoid tripping. The instrument did not have a continuous audible readout. The subcontractor Radiation Safety Officer stated the instrument would produce an alarm if it went full scale (10 mr/hr on the lowest range). While this provided some confidence, the Radiographer's Assistant should have stopped and made a reading at each location presenting the highest potential dose rate at the boundary.

8. The Contractor did not have a RCT or other competent individual present at the work location to perform an independent radiation survey to confirm the adequacy of the radiation boundary, instruct Contractor personnel on appropriate ALARA actions, or evaluate the adequacy of the radiography subcontractor's control of the source.
9. Records of assessments and radiation survey results indicated the Contractor had conducted three audits of radiography vendors. The records indicated independent radiation measurements had not been made during 2002 or the surveys by the subcontractors of their radiation area boundary had not been verified.

The inspectors immediately brought these observations concerning the radiography subcontractor's performance to the attention of the subcontractor's Radiation Safety Officer (RSO), who happened to be at the work site performing a quarterly audit. The RSO took immediate action to secure the source and counsel the Radiographer and his assistant. The RSO documented the improper source control observation in his audit report and described his corrective action.

The procedure, 24590-WTP-GPP-SRAD-028, Revision 0, *Radiation Generating Device Control*, effective September 28, 2001, stated in Section 3.3.5.2e of the procedure, "Radiological Control shall ensure that: Verification surveys of the Radiation Area boundary is performed during each radiography evolution." Despite this, the Contractor's Radiological Operation Lead Engineer stated the procedure did not require him or his staff to perform radiation measurements to verify that surveys of the radiation area boundary were performed during each radiography evolution. He stated his approach was to personally review the subcontractor's license, procedures, and equipment prior to radiography but not to conduct independent measurements or observe each set-up for radiographic operations. The inspectors did not agree with the approach to not conduct independent measurements or observe each set-up for radiographic operations for the reasons that follow: (1) The procedure required verification surveys of the Radiation Area boundary during each radiography evolution; (2) the radiography subcontractor's Radiation Safety Officer stated only one evolution was recorded on the survey records even though multiple evolutions were performed; and , (3) the survey records had only one place to record the boundary survey results (i.e., there was no space for more than one evolution's survey data).

The Radiological Operation Lead Engineer reviewed the observations provided by the inspectors and concluded his procedure and efforts to control radiography during construction needed revision. At the exit meeting on November 21, 2002, the Contractor committed to: 1) review the procedure and revise as necessary to improve the margin of safety associated with radiography operations; 2) perform periodic radiation surveys to confirm the adequacy of the Radiographer's boundary verification surveys; and 3) provide additional training to Contractor representatives that escort the Radiographers to facilitate implementation of the ALARA process. This matter will be reviewed in the future to determine if the Contactor has improved its process to ensure radiation dose associated with radiography operations is maintained ALARA. The inspectors found the above corrective actions acceptable. (Assessment Follow-up Item, A-03-OSR-RPPWTP-003-A02)

On November 20, 2002, the inspectors toured the WTP construction site with a Contractor RCT-qualified individual to observe the status of HLW C5 duct/pipe and PT floor drain

installation. Except as previously noted in Section 1.4.2 of this report, the HLW C5 ducting was installed consistent with 24590-HLW-ADR-PL-02-010, Revision 0, and construction drawings to the extent the pipe appeared to be stainless steel, seamed pipe, butt welded with the open ends covered to prevent the introduction of foreign material. The seams on visible portions of the pipe were horizontally oriented. This was consistent with good ALARA engineering but was not identified as a requirement on the drawings. No slope was observable on portions of the HLW C5 duct/piping installed, but not yet embedded, and no provisions for chemical or mechanical cleaning were observed (e.g., access panels in the piping). PT floor drains appeared to be constructed of stainless steel pipe, butt welded, and sloped to facilitate drainage and cleaning as shown in construction drawings. No additional issues were identified during the site tour.

The inspectors reviewed 19 radiation survey records for 2002, to date, and discussed them with the RCT. The records were associated with soil and background measurements. No measurements above background were recorded. No discrepancies were identified during the record review.

1.5.3 Conclusions

Observation of radiography at the WTP construction site indicated additional control of subcontractors is necessary to ensure dose to Contractor staff will be maintained ALARA during construction. The procedure should be revised to ensure such control. Though the installed HLW C5 duct/piping and PT floor drains were consistent with drawings, the HLW C5 ducting/piping drawings did not match the authorization basis commitments. This was discussed in Section 1.4.2 of this report and identified as a Finding.

1.6 ALARA Records (ITP I-111 and ITP I-151)

1.6.1 Inspection Scope

The inspectors interviewed Contractor personnel and reviewed documentation to assure the Contractor had a system of records to document the actions taken to maintain radiation exposure ALARA. The inspectors examined records discussed in other sections of this report for content and quality.

1.6.2 Observations and Assessments

Documentation of ALARA actions during design was described as a weakness in the last inspection report. As discussed in Section 1.3.2 of this report, the Contractor's assessments found significant record deficiencies by mid- 2002, and used the CAR system to facilitate a change to procedures, provide training, and correct the identified deficiencies. This inspection found the corrective action effective, recognizing the period of records reviewed using the revised procedure was about one month.

Since the last inspection by OSR, function-specific ADRs had been implemented. In addition, engineering drawings created after the Contractor's Management Assessment in September 2002

generally bore the “ALARA block” – a “yes” or “no” check box for ALARA items, plus an ADR number if the box is checked “yes.” The changes help identify ALARA activities and record those activities. The changes should resolve the weakness of not all considerations or actions taken to maintain occupational dose ALARA were being entered into the records management system as identified in Section 1.6.2 of the November 2001 ALARA Program Inspection Report.³

The inspectors also reviewed a number of ALARA related design records generated prior to the September 2002, procedure upgrade to provide the inspectors with an objective overview. These records included, but were not limited to, ADR Records for the HLW Bogie Recovery Systems (24590-HLW-ADR-M-02-006, Revision 0, February 25, 2002), Shielding Doors for Bogie Maintenance Areas (24590-HLW-ADR-M-02-010, Revision 0, March 18, 2002), HLW Shielded Hatch Thickness Requirements (24590-HLW-ADR-M0-01-001, Revision 0, November 19, 2001), and a number of Meeting Minutes (e.g., CCN 027674, February 25, 2002, Services to the Rinse Vessel; CCN 029057, February 21, 2002, ALARA design review of HLW bogie equipment). Though these records were generated prior to the September 2002 procedure upgrade, the inspectors found these documents met the requirements of 10 CFR 835, Subpart H and the Contractor's ALARA program and implementing procedures; the records adequately described the measures taken to maintain radiation exposure in controlled areas ALARA. Interviews conducted with Contractor staff found they were familiar with the ALARA program implementing procedures and associated documentation requirements.

1.6.3 Conclusions

The Contractor's records documented its ALARA program met the requirements expressed in 10 CFR 835, Subpart H and its ALARA program implementing procedures. The documentation of actions taken to maintain dose ALARA had significantly improved as a result of the Contractor's self-initiated assessment.

1.7 Adequacy of Closure of Inspection Items (Inspection Administrative Procedure (IAP) A-105 and A-106)

(Closed IR-02-008-03-IFI) The “Contractor installed C5 duct without using gas purge or grinding backweld inside the pipe. This practice will result in oxidized surface and rough spots inside of the pipe. The Contractor stated they conducted an ALARA review and concluded the welding process was acceptable.”

As discussed in Section 1.4.2 of this report, the contractor failed to fully implement its commitment to design the HLW C5 duct/pipe for decontamination and decommissioning (D&D). The Contractor's ALARA Design Review Record 24590-HLW-ADR-PL-02-010, and Calculation No. 24590 –BOF-ZOC-80-00002, *Dose Rate Estimate from Contamination Accumulation on Pipe Welds*, were reviewed. The calculation assumed the welds would be one-

³ ORP letter from R. C. Barr to R. F. Naventi, BNI, "ALARA Program Assessment Inspection Report, IR-01-022," 01-OSR-0501, dated December 20, 2001.

quarter inch wide and they would accumulate an additional one-eighth inch of radioactive material over the life of the facility. This additional buildup would not result in a significant increase in dose rate at several distances from the source. The calculation concluded, “The dose rates in Table 4 indicate that even with no additional radioactive material in the weld joints, hands on maintenance is not possible. The remote techniques necessary to decommission this piping system would easily accommodate the minor increase in dose rates caused by the hold up of radioactive material in the ‘rough’ surface of the weld area. Therefore, grinding the welds smooth is not necessary from a dose reduction standpoint.”

This analysis did not consider an interior weld surface might contain “nooks or crannies” that could retain quantities of radioactive material during D&D resulting in additional dose and generation of radioactive waste. Given the HLW C5 duct was embedded in a manner that would make it very difficult to remove, it would have been consistent with the ALARA process to inspect the interior surface of each butt weld to verify crevices did not remain. A smooth bore stainless steel pipe, sloped to facilitate remote chemical or mechanical decontamination, would reduce dose and the generation of radioactive waste if the decommissioning process resulted in demolition or reuse of the facility. As a result, this is a failure to fully implement authorization basis D&D design commitments and is considered a Finding as is discussed in Section 1.4.2, of this report. The IFI has been upgraded to an inspection Finding and is described in Section 1.4.2 of this report. This IFI is considered closed.

2.0 EXIT MEETING SUMMARY

The inspectors presented the inspection results to members of Contractor management at an exit meeting on November 21, 2002. The Contractor acknowledged the observations and conclusions presented and committed to revise *Radiation Generating Device Control* as described in Section 1.5.2 of this report. Subsequent to the exit meeting, the lead inspector asked the Contractor representative whether any materials examined during the inspection should be considered limited rights data. The Contractor stated no limited rights data was examined during the inspection.

3.0 REPORT BACKGROUND INFORMATION

3.1 Partial List of Persons Contacted

J. Brower, HLW Mechanical Handling
 W. Buckner, Senior Radiological Control Technician & Radiological Safety Engineer
 D. Cragin, HLW HVAC Supervisor
 F. Galium, Senior Engineering Mechanical Systems
 W. Gripentog, Radiological Safety Engineer II
 D. Henry, Quality Assurance Engineer
 S. Henry, Radiological Operations Lead Engineer
 J. Khojandi, Engineering ALARA Coordinator
 G. Kloster, Technical Baseline Manager
 P. Latham, Mechanical Lead Engineer

M. Leonard, Senior Mechanical Engineer
 G. Maedgen, Quality Control Engineer
 T. Martin, Radiation Safety Officer, Northwest Inspection
 R. Miles, Radiological Safety Engineer II
 B. Niemi, Safety Program Engineer
 M. Perks, Radiological & Fire Protection Manager
 D. Pisarcik, Engineering ALARA Coordinator
 J. Pullen, HLW Melter Systems Supervisor
 T. Rountree, ES&H Supply Representative
 J. Rouse, HLW Lead Process Engineer
 T. Ryan, PSC Secretary
 E. Smith, Safety Program Engineer
 A. Tan, HLW C5 HVAC Engineer
 R. Winslow, Radiological Safety Engineer II

3.2 List of Inspection Procedures Used

Inspection Technical Procedure I-111, Revision 4, *ALARA Program Assessment*

Inspection Technical Procedure I-151, Revision 0, *RCP Documents, Records, and Report Assessment*

Inspection Administrative Procedure A-105, Revision 2, *Inspection Performance*

Inspection Administrative Procedure A-106, Revision 2, *Verification of Corrective Actions*

3.3 List of Items Opened, Closed, and Discussed

3.3.1 Opened

A-03-OSR-RPPWTP-003-F01	Finding	Evaluate the Contractor's actions to implement the commitments made in response to LAW-PSAR-197 and -198 concerning the HLW C5 embedded duct/ piping.
A-03-OSR-RPPWTP-003-A02	Assessment Follow-up Item	Determine if the Contactor has improved its process to ensure radiation exposure associated with radiography operations is maintained ALARA. Specifically, review changes to 24590-WTP-GPP-SRAD-028, <i>Radiation Generating Device</i>

Control, to verify the commitments described in Section 1.5.2 of the Inspection Report were implemented.

3.3.2 Closed

IR-02-008-03-IFI Inspection Follow-up Item Section 1.7 of this report

3.3.3 Discussed

None

3.4 List of Acronyms

ALARA	as low as reasonably achievable
ADR	ALARA Design Review
AFI	Assessment Follow-up Item
ASC	ALARA Subcommittee
BNFL	BNFL, Inc.
BNI	Bechtel National, Inc.
CAR	Corrective Action Request
CCN	Correspondence Control Number
CFR	Code of Federal Regulations
D&D	decontamination and decommissioning
DCD	Design Criteria Database
DOE	U.S. Department of Energy
E&NS	Environmental and Nuclear Safety
ERPP	Environmental Radiation Protection Program
ES&H	Environmental Safety and Health
HLW	High-Level Waste
HVAC	Heating Ventilation and Air Conditioning
IAP	Inspection Administrative Procedure
IR	Inspection Report
ISM	Integrated Safety Management
ISMP	Integrated Safety Management Plan
ITP	Inspection Technical Procedure
ITS	important-to-safety
LAW	Low-Activity Waste
LMH	LAW Melter Handling System
LSH	LAW Melter Equipment Support Handling System
MA	Management Assessment
ORP	Office of River Protection
OSR	WTP Safety Regulation Division
P&ID	Piping and Instrumentation Drawing

PSC	Project Safety Committee
PT	Pretreatment
QA	Quality Assurance
QAM	Quality Assurance Manual
QAP	Quality Assurance Program
RCT	Radiological Control Technician
RPP	Radiation Protection Program
RPP WTP	River Protection Project Waste Treatment and Immobilization Plant
RSO	Radiation Safety Officer
SRD	Safety Requirements Document
WTP	Waste Treatment and Immobilization Plant